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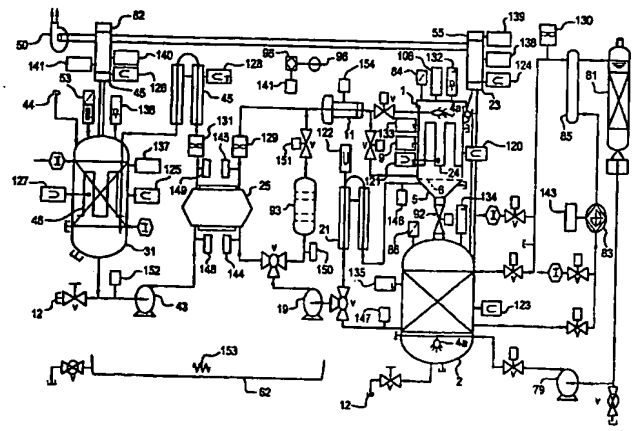
(54) Title: APPARATUS AND PROCESS FOR MEDIATED ELECTROCHEMICAL OXIDATION OF MATERIALS



(57) Abstract: A unique apparatus unique apparatus and process that uses mediated electrochemical oxidation (MEO) for: (1) Destruction of: a) nearly all organic solid, liquid, and gases materials, except fluorinated hydrocarbons; b) all biological solid, liquid, and gases materials; c) and/or dissolution and decontamination (such as cleaning equipment and containers, etc.) of nearly all inorganic solid, liquid, or gas where higher oxidation states exist which includes, but is not limited to, halogenated inorganic compounds (except fluorinated), inorganic pesticides and herbicides, inorganic fertilizers, carbon residues, inorganic carbon compounds, mineral formations, mining tailings, inorganic salts, metals and metal compounds, etc.); and d) combined materials (e.g. a mixture of any of the foregoing with each other); henceforth collectively referred to as materials. (2) Sterilization/disinfection of equipment, glassware, etc., by destroying all existing infectious materials. (3) Dissolution of transuranic/actinide materials and/or destruction of the oxidizable components in the hazardous waste portion of mixed waste. (4) Generation of hydrogen and oxygen from MEO of materials. (5) Alteration of organic, biological, and inorganic materials by MEO to produce other compounds from these materials. The materials are introduced into an apparatus for contacting the materials with an electrolyte containing the oxidized form of one or more reversible redox couples, at least one of which is produced electrochemically by anodic oxidation at the anode of an electrochemical cell. The oxidized forms of any other redox couples present are produced either by similar anodic oxidation or reaction with the oxidized form of other redox couples present and capable of affecting the required redox reaction. The oxidized species of the redox couples oxidize the materials molecules and are themselves converted to their reduced form, whereupon they are reoxidized by either of the aforementioned mechanisms and the redox cycle continues until all oxidizable material species, including intermediate reaction products, have undergone the desired degree of oxidation. The entire process takes place at temperatures between ambient and approximately 100°C. The oxidation process may be enhanced by the addition of reaction enhancements, such as: ultrasonic energy and/or ultraviolet radiation.

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